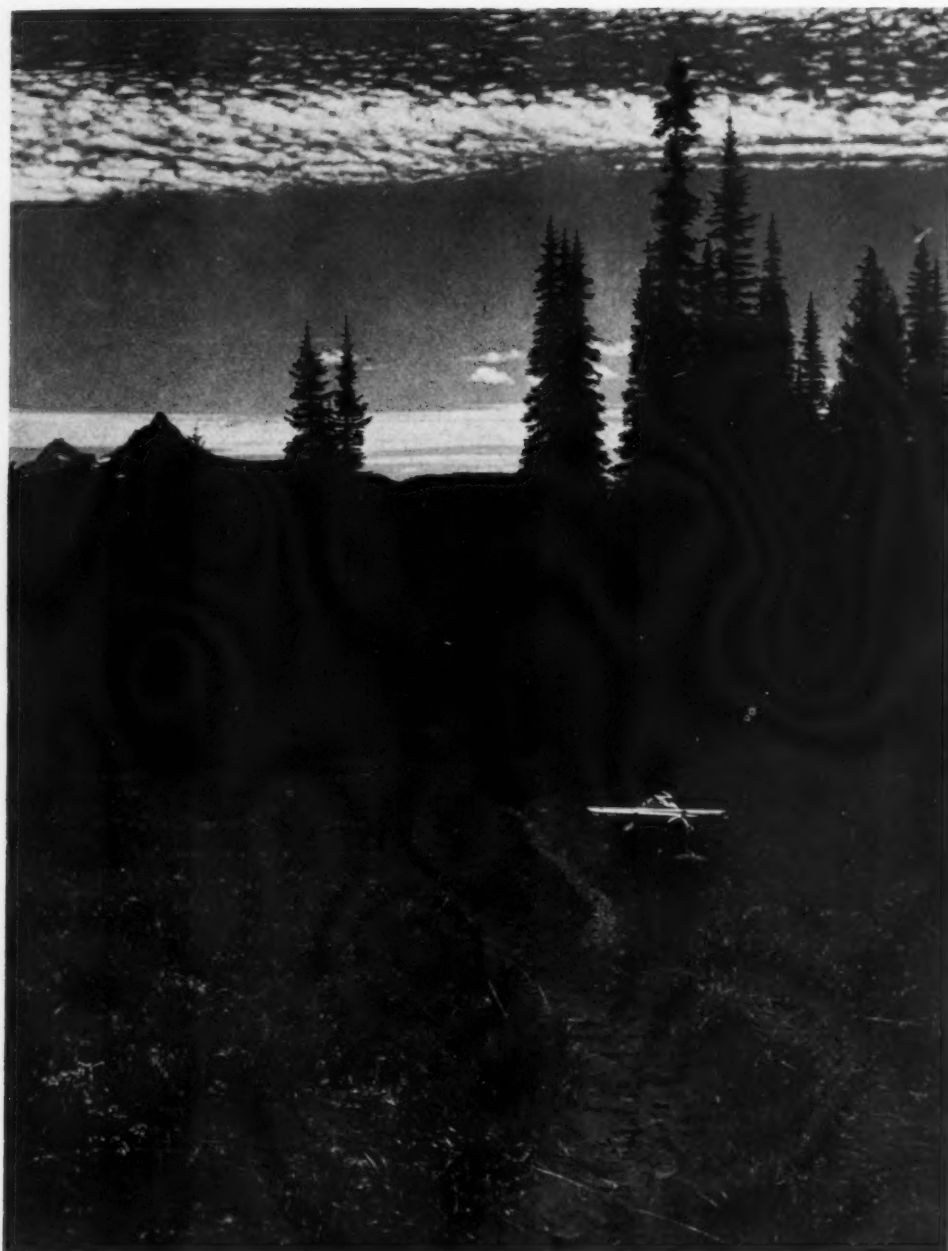


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SIERRA CLUB BULLETIN

May 1961 ~~BP~~ FP



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The greatest of all
gardens are the
gardens of the wild.
They cost not a penny
to maintain and they
are the most beautiful.

— W. Douglas Burden
in *Look to the Wilderness*

Project Chariot — The Long Look

Uneasy Chair

Moby Dick (Reinterpreted), A New Generation, and Alaska

In his address at the Wilderness Conference, Everett Carter (Vice Chancellor, University of California, Davis), looked at *Moby Dick* with a conservationist's insight. Concurrently, a 16-year-old junior at Berkeley High School was doing the same thing, less beautifully, perhaps, but with no less concern—a concern directly related to the kind of excavating proposed for Alaska and discussed in full in the body of this *Bulletin* because it seems so important.

So we take them in order—an introductory note by Dr. Carter, an independent view by a young man who would like to think he has a good three decades ahead of him, and finally (pages 4-17) some expert documentation.

Vice Chancellor Carter:

"There are many meanings to *Moby Dick*. But one of them is certainly the vision of the mad quest of Ahab to revenge and exploit nature, and the inevitable destruction of the man who tries to probe the meanings of the universe. The Melville that has spoken down through the years to our modern imagination is a man who wrote of this quest to ravage and exploit, who saw the horrors of Liverpool and compared it to the beauties of Nukihiva, who wrote a parable of the way in which man, by erecting his towers, creates a monster which destroys him."

Sixteen — and Three Decades Ahead

"The crew of the *Pequod* and its Captain Ahab have much the same attitude toward the white whale Moby Dick as mankind has had toward the forces of nature. The strange mixture of admiration, awe, and hate that throughout history man has felt toward his environment is present among the men of the *Pequod*. Also present is man's powerful, unreasoning drive to subdue and tame his environment.

"Ahab himself does not know the full nature of his monomaniac drive, as he reveals in his conversations with Starbuck. His purpose, complicated and obscure even to himself, is certainly not merely one of revenge for his lost leg. Perhaps he is seeking revenge against the sea itself, the all-powerful natural force that has taken forty years of his life and returned him so little—nothing but memories of a brutal, lonely existence of comfortless, back-breaking work. Perhaps he is picking the mightiest destroyable creature of the mighty invincible sea on which to unleash the fury of his frustrated life.

"Less extreme than the motivations of Ahab are those of the *Pequod*'s crew. The ease with which the skillful Ahab imparts the fire of his hate to the crewmen is revealing. These men have no real reason for sharing Ahab's hate for Moby Dick, but determination almost equal to Ahab's is instilled in them. To them, as to mankind, the conquest of nature seems a noble, glorious cause. In this respect

COVER: A wilderness outing is planned for this summer in Oregon's beautiful Mount Jefferson Primitive Area, August 14-25. The Skyline Trail leads through some of the finest scenic country in the Oregon Cascades that is still in its near natural state. Jefferson Park, where the trip will base camp for three days, is a high alpine plateau carpeted by wildflowers, dotted with many small lakes, ponds and islands of alpine fir trees. The Oregon Skyline Special is part base camp, part pack trip around Mt. Hood. Wilderness Card No. 48. Photo by Sanford S. Tepfer. Quote from Look to the Wilderness, by W. Douglas Burden, published by Little Brown, Boston.

the harpoon of Queequeg serves the same purpose as the logger's axe or the highway engineer's dynamite or the mountain climber's piton.

"Until the story's end the *Pequod*, like civilization now, has successfully fought the battle against her environment. Occasional pang of remorse are felt—Starbuck's for the cruel wounding of an old sperm whale, civilization's for the extinction of the passenger pigeon, as evidenced by belated concern for the whooping crane.

"All the qualities of nature are present in her creation, the white whale. Moby Dick has the cruelty, the beauty, the power, and above all the mystery that nature shows to her creatures. The whole *Pequod*'s company, even Ahab, stares in wonder and admiration as Moby Dick first breaches, but, seconds later, the boats are lowered for the chase, with the intent to kill the whale or perish. All speculation as to the unknown depths at which the monster feeds and as to the miracle which created him are forgotten. The only thought is to bury harpoons into sides which took untold millions of years to evolve. So it is with man today. We see before us mountains of a rugged grandeur that take our breath away; our next reaction is to place a highway through the center of the range. Our history books tell the glorious story of how "Americans then turned to the great task of conquering a continent." And Americans, the least creative of peoples, did turn with zeal to this task of destruction and our once primitive continent has finally submitted.

"The compulsion to dominate nature has no practical purpose. It is no instinct necessary to man's survival, no trait imparted to him by the process of evolution. No species must conquer its environment to live successfully within its limits. Until recently it has not been hinted that this quirk of the human mind might perhaps be suicidal.

"The final fate of the *Pequod* can serve as a warning to a civilization existing a century after Melville's of a danger that Melville could not have conceived. In attempting to destroy Moby Dick the *Pequod* was rammed and sunk by the badly wounded whale. So it could well be with man, unless he quickly comes to realize that he is a product and a part of his environment. If he forgets this, and continues his subjugation of nature, breaking contact with an evolutionary cycle observable now only in wilderness, he will find himself alone. He will discover, and too late, that he is not so independent of nature as he thought. Whether by misjudging the power of his bombs or exhausting his natural resources in feeding his exploding population, man will destroy himself as inevitably as Ahab did.

"And his environment will have the last word. Just as the troubled sea settled above the spot where the *Pequod* sank, so life in its simplest forms would begin anew."

The student, who is related to the staff, prefers to remain anonymous. Guessing his name wouldn't be too hard.—D.B.

RAINBOW BRIDGE—A special 16-page tabloid issue of the *Outdoor Newsletter* (Vol. 2 No. 1) on what may be the "greatest welsh in conservation history" is being prepared for distribution to *Newsletter* subscribers as we go to press. (*Newsletter* subscriptions are \$2 for 10 issues.) A shorter story on the Rainbow Bridge crisis will be included in the June issue of *Sierra Club Bulletin*.

THE SIERRA CLUB,* founded in 1892, has devoted itself to the study and protection of national scenic resources, particularly those of mountain regions. Participation is invited in the program to enjoy and preserve wilderness, wildlife, forests, and streams.

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Sierra Club Bulletin

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...TO EXPLORE, ENJOY, AND PROTECT THE NATION'S SCENIC RESOURCES...



Why not come and see a few of the wild places not difficult to reach, but hidden from the eyes of the average traveller? From the summit of the ridge at Jefferson Park, you get an eagle's eye view that's hard to beat. There have been natural calamities here: during the winter of 1932-33 a moraine on the mountain-side gave way and the lake behind it washed everything in its path down into one corner of the park. Not too many years ago a portion of the mountain's summit fell away, changing the climbing route.

And Mt. Hood isn't entirely dead. About 100 years ago flashes of fire were seen and a large mass of the northwest side disappeared. Now sulphur fumes issue from vents 10,000 feet up in the crater. We'll see Gnarl Ridge too, with its old trees wind-blown and twisted by countless snows, then polished by driving sand and summer sun. Sounds wild? It is—and we love it! Why else do we leave our comfortable chair by the TV or our chaise longue on the patio every summer? Come and join us in the Oregon Cascades, August 14.

Photo of Burnt Lake near Mount Hood
by Alfred Schmitz.

Have You Made Your Vacation Plans?

Openings are still available on a few of the Sierra Club's finest 1961 summer outings in the high mountains of the West, the Outing Committee reports. Most of the Club's 48 summer outings this year, however, have long since been filled and some have waiting lists.

The openings which remain are on two High Trips in the Southern Sierra Nevada, three base camps in the central Sierra and a special, two-part trip in the Oregon Cascades. Costs vary from \$72 to \$100 per outing, depending on the trip.

Both High Trips will start from Mineral King, California, the first on July 23 and the second on Aug. 6. Both are of two weeks' duration, but will cover different sections of the superbly scenic Great Western Divide country lying between Mineral King and Mount Whitney in the Sequoia-Kings Canyon National Park. The sight of the gigantic canyon

of the Kern River is worth the trip alone.

The Club's High Sierra base camp, located this year at Baboon Creek, near Bishop, California, has openings in all three of its 13-day divisions which start July 8-9, July 22-23 and August 5-6. If you like to enjoy your wilderness intensively, perhaps for sketching, photography or nature study, the Base Camps are ideal. The Camp management promises the usual excellent food and offers a variety of interesting activities—from daisy sniffing to class five mountaineering.

Anyone of any age from six to 76 who is a member or eligible for membership in the Sierra Club or of any one of many other outdoor clubs and who is in good physical condition may participate in these outings. Full information may be obtained by writing the Sierra Club, Outing Program, 1050 Mills Tower, San Francisco 4.

Photo by William Dunkerley



Project Chariot—The Long Look

In a speech three years ago, the Sierra Club was described by its executive director as "not blindly opposed to progress, but opposed to blind progress." Professor Paul Sears has amplified this view by saying, "The folly is that because something becomes technically possible, any and all of its applications are therefore justified and the consequences can be left to work themselves out."

What follows is a reprint, almost in full, of the March 1961 News Bulletin of the Alaska Conservation Society. Quite a few members of the Sierra Club are also members of the Society (Box 512, College, Alaska; dues \$2) and have already seen the document which we reprint here because we think it raises important questions that no one, anywhere, can allow himself or anyone else to gloss over. The Sierra Club cannot attest to the accuracy of everything that is said by Editor Ginny Hill Wood or by ACS President Dr. Leslie A. Vierick, nor can it disprove anything they have said.

The questions need to be faced, especially by conservationists. When John Donne said, "... for I am involved in all mankind,"

he could hardly have had an inkling of how much more involved we would be in our generation, of how much we might damage the world of all generations to come with the new power man can now unleash in what has been called, or miscalled, "The Great Adventure."

On May 6 the Sierra Club Board of Directors said this of Project Chariot: "The Sierra Club commends and supports the Governor of Alaska for his stand in opposition to Project Chariot, the controversial proposal for a nuclear test excavation in the region of Cape Thompson, Alaska, pending a more complete study of total effects including damage to native people, wilderness and wildlife."

Dr. Vierick's concern is by no means his alone, or the Alaska Conservation Society's alone, or conservationists' alone, or biologists' alone. We don't pretend to know the answers to the questions he asks. We can feel some of them in our bones, however, and we do know that we must have carefully reasoned answers before any irrevocable step is taken. We're all in this world together—so far!

—Editor

IN THE OFFING for Alaska loom two major technological projects which will have far-reaching effects on the land, the flora, the fauna, and the way of life of aboriginal inhabitants of Alaska. A third has been suggested, but seems in little likelihood of immediate consideration.

The schemes are: 1) Project Chariot, the proposed experiment in using nuclear explosives for geographical engineering by the Atomic Energy Commission at Cape Thompson on the Arctic coast; 2) the Rampart Dam, a hydro-electric project on the Yukon River projected by the Corps of Engineers that would inundate an area larger than Lake Erie; and 3) the Bering Sea Dam,* first suggested by the Russians, that would pump cold water from the Arctic Ocean into the Pacific and change the climate from frigid to temperate by hastening the flow of warmer Atlantic waters into the northern seas.

The announcement of such projects as these can be expected at first to be greeted

* Dunbar, M. J. 1960. On the Bering Strait Scheme. Polar Notes, No. 2:1-18

with high enthusiasm by Chambers of Commerce dazzled by \$\$ signs; by engineers, technicians, and some scientists who, with small boy curiosity, want to see "if it will work"; by laborers thinking of the payroll involved; and by the general public imbued with the "Gee - Ain't - Science - Wonderful" spirit.

Those who take a longer look at these proposals are motivated by values much different. Biologists, aware of life in all its forms, realize the intricate inter-relations of the biotic community and how outside factors can so easily upset the delicate balance of nature. The anthropologists see the interdependence between the natural environment and the way of life of a native people. The intelligent citizens whose tax dollars will pay for these projects want to know whether what they are getting is worth what they are giving up. As conservationists, we are concerned with any use of land which alters the environment and affects the plants, animals, and the people who depend on them for subsistence.

No one proposes that all Alaska be kept in an unspoiled state of nature. Few among

us would want to forego all the benefits to comfortable living that technological development has made possible. But we do question technological advancement when it becomes an end in itself.

We must keep in mind that government agencies such as the Atomic Energy Commission, the Bureau of Reclamation, the Corps of Engineers, and the Department of Defense are in the business of selling their own products and services. Like any other business they will use all the techniques of Madison Avenue to create a receptive public, whose taxes support their endeavors. The fallacy is that most of the interpretation of surveys and data on the feasibility of a project is made by the same agency promoting the project. This is like asking the tobacco industry to make an objective analysis of the effects of smoking on health. Hence, it behooves an organization such as the Alaska Conservation Society to serve as a fact-disseminating committee so that independent judgment motivated only by a search for truth can be made.

To believe blindly that those at the top know what is best is to deny the basic principles of democracy. As cases in point we would like to cite the attempt to create an "Atomic Park" on Cape Cod in Massachusetts (See *The Nation*, June 25, 1960); and the hassle over the proposal to construct the Lagoon Beach atomic power plant near Detroit (See column "Allen and Scott Reporting," *Fairbanks Daily News Miner*, Feb. 9, 1960).

The story in Cape Cod involves the attempts to by-pass public opinion and public safety to establish a 20,483-acre site which would become a receiving dump for high level atomic wastes in a highly-populated

In Alaska, caribou in primeval numbers now survive only in the remote Arctic, which is too wet to burn and has not yet been substantially invaded by man.



area 50 miles from Boston. Backed by eight legislators, innocent of what is involved in atomic science, the Cape Cod Chambers of Commerce, and a commission composed of members of the atomic industry (including one whose public relations included a publication entitled: "Developing Consumer Acceptance in Radioactivity"), a bill was introduced in the Massachusetts Legislature to establish an "atomic park."

All went well until an innocent reader of the Falmouth *Enterprise*, a small newspaper, sent in a letter to the editor requesting information about the "park." "We Are Ignorant But We'd Like to Know" was the editorial answer. This started aroused public investigations by concerned citizens. Brought out in this investigation was the threat to local cranberry bogs by radiation, the fact that another site north of Boston had been turned down because prevailing winds blow toward Boston, and testimony from a retired Army general formerly active in atomic science, who said, "I can give you some examples of things that can happen that would create panic in the audience." Legislative hearings and the testimony of qualified neutral experts resulted in the project being cancelled.

[At Lagoona Beach near Detroit, work went ahead with the construction of a \$100 million atomic power plant despite vigorous opposition, including the advice of some of AEC's own Reactor Safety Committee, based on grounds of public safety. A decision by a U.S. Circuit Court revoked the license granted by AEC to build the plant. The AEC appealed and won. Before Attorney General Kennedy is a report of 40 atomic reactor accidents since 1948, in contrast to the AEC claim that there has been "a perfect record of safety of regular operating reactors."]

In the case of Project Chariot, it is vitally essential for the state of Alaska to demand that all data covering every aspect of the proposed nuclear explosion be submitted to an independent, unbiased team of qualified scientists for evaluation. Field investigations, both of an engineering and environmental nature have been under way at Ogotruk Creek, site of the proposed excavation, for over two years. Based on statements made by the AEC and their contracting agency, the Lawrence Radiation Laboratory, and on the well-documented research reports of individual scientists doing field work in the area, sufficient grounds exist to question seriously the advisability of the proposed nuclear explosion. This issue of the *News Bulletin* will attempt to present a comprehensive review of Chariot to date.

In regard to the Rampart Dam, very little field work has been done. The Alaska Conservation Society in this case withholds judgment until all the evidence, pro and con, can be carefully weighed.

GINNY HILL WOOD

The greatest abundance of wolves under natural conditions is precisely in those areas where game animals, especially caribou also are most abundant and flourishing. The Sierra Club hopes to see a complete study of Project Chariot's effects on native people, wilderness and wildlife.



What's Going on Here?

(The following statements have been made by spokesmen for the Atomic Energy Commission and others through the newspapers. Some of these statements are in themselves contradictory. Others do not agree with data presented elsewhere in this issue of the News Bulletin, all of which points up the necessity of continuing interest and inquiry by the Alaska Conservation Society and all concerned citizens.)

"We know now," said Dr. John N. Wolfe (chairman of the AEC Environmental Research Committee), "that the excavation won't affect the health, food sources, and general livelihood of the Natives." . . . From the Fairbanks *Daily News Miner*, December 5, 1960.

In a statement made before the Alaska State Chamber of Commerce meeting October 29, on the University of Alaska campus, Dr. John N. Wolfe stated:

"The committee (Environmental Research Committee) will recommend in a very short time that the blast need not be called off on biological grounds."

From the *New York Times*, August 17, 1960: Dr. John N. Wolfe, an AEC scientist, said a 15-month field study costing \$2,000,000 had produced no evidence that the detonation would damage the Eskimo relationship to their environment and livelihood.

"I would say," Dr. Wolfe told a news conference at the headquarters camp near Cape Thompson, "that there are no biological objections to the shooting on the basis of our investigations. Obviously with a neighbor as close as 180 miles away (Russia) there may be problems of which we are not aware and which you would have to take up with the State Department."

From *Outdoor Life*, January, 1961 article "A-Test Alaska Threat?" by Arthur Grahame. In answer to concerns expressed by Alaskan sportsmen over Project Chariot, the author states that he made a fact-finding round of the Atomic Energy Commission and other concerned government agencies and obtained the following facts:

"Although the environmental studies committee declined to make its final decision on the basis of data known to it late in 1959, it also expressed its unanimous opinion that Project Chariot can be carried out under the conditions that in no case should radiation be delivered to humans (specifically to the villagers of Point Hope and Kivalina) in excess of that specified as acceptable for the general public, nor should the detonation cause significant damage to the food sources (principally wildlife and fish) of the people living near the project area . . .

"No one denies that probably there would be some radioactive contamination of the debris, but AEC opinion is that it would be slight. A spokesman for the Environmental Committee assured me that a caribou standing in the open just outside a 20-mile radius of the 200 kiloton shot wouldn't receive more radiation from it than it would receive normally in any year of its life from existing background radiation. . . .

"There would be a careful search of the area just before zero hour . . . to make certain that there were no humans in it, and to drive out any caribous or other big game that chanced to be there. (Ed. note: Ever try to drive a caribou?). Almost certainly it would be necessary to keep the area closed to general use for several months. . . .

" . . . The Environmental Committee has recommended the detonation be planned for March or April. At that time of year the spring thaw is near, and it is thought that the run-off from rapidly melting snow would decay appreciably before entering the sea at the break-up. Other advantages of an early spring target are that there is little hunting at that time, few birds are present, and most of the small animals and plant life are under snow cover."

When asked to comment on the June 14, 1959 Russian accusation that Chariot was a disguised weapons test, Dr. Edward Teller, then head of the Lawrence Radiation Laboratory, said (from the *Anchororage Times*, June 26, 1959), "I will say this, however, and it is not in answer to your question about the Russians, that we will give very



The Wolverine, which occurs in relatively high frequency in the Ogotoruk region, is considered by the National Wildlife Federation to be in danger of extinction. Some scientists want to know what a nuclear blast will do to such species.

serious considerations to shooting at such a time when the wind is blowing inland so that what little radiation there is will land on the snow and ice. . . ."

From the Fairbanks *Daily News Miner*, April 27, 1960—"Radioactive fallout of less than 5 per cent," he (Dr. John N. Wolfe) said, "would drift westward toward nearby Siberia if the tests were conducted in March, the time (he) termed best for the project.

"This might not be politically the best direction for the cloud to travel—toward Russia—but it is the best way for us, biologically."

From the Fairbanks *Daily News Miner*, March 23, 1959—Dr. Henry D. Smyth, one of the original members of the Atomic Energy Commission, gave his views to the committee (Senate-House Atomic Energy Subcommittee): "Even if our use of nuclear explosions for peaceful purposes promises to contribute significantly to our material welfare, I still question its political advisability in terms of international understanding and peace."

No Biological Objections?

In a letter to the Atomic Energy Commission, Senator Bob Bartlett of Alaska raised the following question:

"I have heard some vague rumors that some of the biologists and other researchers working on the project are not in accord with the AEC conclusions and that they might possibly bring out a minority report . . . is this true?"

A. R. Luedecke, general manager of the Atomic Energy Commission, did not answer Bartlett's question, but replied as follows:

" . . . Mr. Don Charles Foote, one of our contractors for the Project Chariot Bio-Environmental Survey Program, has stated that he believes that Project Chariot Bio-Environmental Survey Committee has exceeded the authority granted to it in its charter. . . . I would like to point out that

of 85 investigators employed in these surveys, Mr. Foote is the only member to develop this extreme attitude."

On December 29, Leslie A. Viereck, assistant professor of botany at the University of Alaska and senior investigator in botanical studies with the Environmental Research Studies for Project Chariot submitted his resignation stating that he could no longer work on the botanical project at Cape Thompson after the end of his present contract. In explaining his reasons for resigning from all connection with Project Chariot, Viereck made the following statements to Dr. William R. Wood, President of the University of Alaska and to the Project Chariot Environmental Committee:

"At the time (I took the position as botanist with Project Chariot), I felt the study would be purely biological in nature and would in no way become involved in the politics of the AEC. Subsequent events have shown that this is not to be the case, and the situation has now reached the point where I feel that I can no longer maintain my personal and scientific integrity and work for the AEC project.

"It has often been stated that a scientist working under a government contract should not worry about the interpretation of the data he is hired to collect. I strongly disagree with this attitude and feel that it is the duty of every scientist to protect his data and to be sure that it is interpreted correctly. A scientist's allegiance is first to truth and personal integrity and only secondarily to an organized group such as a university, a company, or a government. If we allow government agencies to interpret our data we are falling down in our duties as scientists, especially in these present times when so much research is supported by these government agencies. Research funds are at present largely under the control of the federal government and we face a real danger that these funds will be used to control all research and eventually the universities. It is therefore important for each researcher to maintain loyalty to his scientific discipline whether he works for a private company, a university, or a public agency.

"One of the main objectives of the environmental studies at Cape Thompson has been to provide a basis for an assessment of the biological damage that will be incurred with the detonation of the nuclear blast. It is the task of the Environmental Committee to examine the reports and work of the many investigators and to then make recommendations regarding the feasibility of the blast. This Environmental Committee is made up mainly of biologists, most with experience in the Arctic, and most of whom I admire and respect as scientists. It is with their actions as a Committee that I register protest and with which I no longer wish to be associated. I will present a few of my objections to the Committee's actions below.

"One thing that should be determined by the biological studies is the best time of year for the blast as far as environmental conditions and biological processes are concerned. As early as June 1959, AEC and Livermore physicists stated that the months of March and April would be the best time for their activities during the blast time. This was repeated often before and during the first months of the environmental studies. But it was astonishing to discover that the supposedly unbiased Environmental Committee also recommended these two months in a news release on 7 January 1960 at a time when no environmental studies had taken place at Ogotoruk Creek during the recommended months of March and April.

"This news release by the Environmental Committee was protested in a letter by myself, Dr. A. W. Johnson, Dr. William O. Pruitt, and Dr. L. Gerard Swartz in early June to the members of the Environmental Committee. This letter was never properly answered by members of the committee although we did receive a brief letter from Dr. John Wolfe, chairman of the committee. At this time, 11 July 1960, he wrote, "At the committee meeting in Seattle a new statement was prepared and when it is finally reviewed by each of the members, I will forward copies to you." No new statement was ever forwarded to us or made public.

"Dr. Wolfe's letter went on to say that the regular, thrice daily observations of weather at the site led the committee to the statement that most plants are snow-covered in March (one of the several statements that we protested in our letter). However, it is clear from the dates of the original committee news release (7 January 1960) that no weather information was available from the site for the March and April period. By the time Dr. Wolfe wrote his reply in July, of course, there was.

"This was the first indication that any of us had that the Environmental Committee was merely going along with the predetermined policy of the AEC and was not using the reports of the investigators to formulate their decisions.

"There have been other similar instances that have been verbally protested by myself and others of the biological investigators. They are primarily involved with statements issued by members of the Committee that the biologists working on the project have proven that there will be no biological damage from the blast and that the biologists are 100 per cent in favor of going ahead with the blast.

"On 17 August 1960 the *New York Times* had the following to say: "Dr. John N. Wolfe, an Atomic Energy Commission scientist, said a 15-month field study costing \$2,000,000 had

produced no evidence that the detonation would damage the Eskimo relationship to their environment and livelihood. . . . "I would say," Dr. Wolfe told a news conference at the commission field study headquarters camp near Cape Thompson, "that there are no biological objections to the shooting on the basis of our investigations."

"At the same time a statement in *Jessens Weekly* stated, 'This last winter, for the first time in many years, natives hunted in the Cape Thompson area. Why? The Jamesway huts which lodge the scientists in summer are abandoned in winter and make comfortable temporary homes while on the trail.'

"These statements were made at a time that Dr. Wolfe and the Environmental Committee had in their possession the report of Mr. Don C. Foote which stated that the area had always been used as an important hunting area and that the natives of Point Hope were dependent on the area during much of the year for their caribou hunting. Dr. Wolfe, from whom the above statements were quoted, was then ignoring the findings of Mr. Foote. Mr. Foote concluded in his report, 'Any event which would prevent the Point Hope hunters from reaping a harvest during any month of the year, but especially in those periods from mid-January to early July and from September to December could bring profound hardship to the village.'

"Of all the months of the year, March and April are in many ways the most critical for the residents of Point Hope. This is the period when inland hunting activities in and near Ogotoruk Creek, and the coastwise traffic over Ogotoruk Creek usually are at their maximum.

"One must assume that Dr. Wolfe was ignoring the report of Mr. Foote when he made the statements to the reporters at Ogotoruk Creek in August of 1960 that there was little to no hunting in the Ogotoruk Valley and that there were no protests from any of the investigators. There have been so many similar statements issued by the Environmental Committee chairman that one can only assume that the press is correctly quoting him.

"Because of the repeated inference that all of the biologists are in favor of the shot and that it has been proven that there will be no biological damage, I feel that I can no longer have my name associated with the project. Because the Project Chariot study is not a purely biological study but one intimately connected with AEC politics and directed by an Environmental Committee that is biased in its decisions and membership, I wish to resign from the project. I greatly regret doing so because I realize that the biological knowledge gained by this study is of great value and that the study as a whole is one of the best ever conducted in an Arctic region.

"In summary, I wish to resign from a connection with the Project Chariot Environmental Program at the end of the current contract in July 1961 for the following reasons:

1. The Environmental Committee has refused to adequately answer our protests of June 1960 regarding their premature statement of 7 January, 1960.
2. The Environmental Committee or its individual members have continued to issue public statements contrary to the findings of the biologists working on the project.

3. The results of the feasibility studies of the potential biological damage from the proposed blast and the best time of year for the blast appears to have been predetermined.

Sincerely yours,
LESLIE A. VIERECK"

Scientists Have Obligation "To Say What They Know"

Sir Charles P. Snow, addressing the American Association for the Advancement of Science in New York recently, said:

" . . . More than likely, the moral and intellectual leadership of science will pass to biologists, and it is among them that we shall find the Rutherfords, Bohrs, and Franks of the next generation. . . . Soldiers have to obey. Scientists have to question, and if necessary to rebel. . . . I am not suggesting that loyalty is not a prime virtue. But I am saying that loyalty can easily turn into conformity, and that conformity can often be a cloak for the timid and self-seeking.

"When you think of the long and gloomy history of man, you will find far more hideous crimes have been committed in the name of obedience than have ever been committed in the name of rebellion. The German officer corps were brought up in the most rigorous code of obedience. Yet in the name of obedience they were party to, and assisted in, the most wicked large-scale actions in the history of the world. Scientists must not go that way. . . . Only a very bold man, when he is a member of an organized society, can keep the power to say "no". . . . It is not enough to say that scientists have a responsibility as citizens. They have a much greater one than that, and one different in kind. For scientists have a moral imperative to say what they know."

Governor Egan Comments on Cape Thompson Explosions

That the state of Alaska is aware of its responsibilities concerning the effects of Project Chariot and means to carry them out is pointed out by the following speech by Governor Egan made before the Alaska Sportsmen's Council at Juneau, January 13.

Governor Egan said, in part:

"Concern has been expressed in some sections of Alaska as to the effect which this explosion, if conducted, might have on the fish and game resources in the vicinity of Cape Thompson. I can assure you that these questions of the effect not only upon wildlife resources but the safety of the residents who inhabit the area have been uppermost in my mind during the several discussions which I and other of your State officials have had with personnel of the AEC and others associated with this project. They will continue to do so.

"As you know, these possible effects have been the subject of extensive research and study by some 50 scientists and technicians

over the past two summers. Their findings are now being prepared for submission to the AEC's environmental studies committee which is but the first of a chain of agencies and individuals, including myself and the President of the United States, who must give approval before the proposed blast can be undertaken.

"I strongly endorse the position which has been taken by your executive director, Mr. A. W. (Bud) Boddy of Juneau, that the results of this research and study be given wide distribution and discussion before final judgments are made.

"There will be no explosion until and unless your State Administration is convinced that such an event can be carried out with due regard for the safety of the State's resources and population. I have every intention of exercising that prerogative."

Eskimo Legislator Demands Assurance

Resolution HJR 5 calling for a halt to preparations for Project Chariot, the proposed nuclear blast at Cape Thompson, until full assurance of the safety of the people and wildlife of the area is given by the Atomic Energy Commission, was introduced by Rep. Jacob Staulker, an Eskimo legislator from Kotzebue, and passed in the House. To date the Senate has added a clause requesting that all data on the Project be referred to an independent group of scientists (not AEC personnel) for decision, and returned the bill to the House.

Text of the Staulker resolution follows:

WHEREAS, the Alaska State Legislature did approve Senate Joint Resolution No. 13 in 1960 asking that the Atomic Energy Commission inform the residents of the villages in the Cape

More prolific than intelligent, the red-backed vole—and his cousins the lemmings—support a small aristocracy of cunning predators, including fox and wolverine.



PROJECT CHARIOT

Thompson area regarding the planned nuclear explosion at that site; and

WHEREAS, the cursory information since provided by the Atomic Energy Commission representatives did not include any assurances to the citizens of that area as to the import of a nuclear explosion on their personal safety, health, and on the marine and land wildlife which is their source of livelihood; and

WHEREAS, these elements of life, liberty and the pursuit of happiness are of equal importance to all American citizens including the residents of these remote Eskimo villages;

BE IT RESOLVED by the Legislature of the State of Alaska in Second Legislature, First Session assembled, that the President of the United States is respectfully urged to direct the Atomic Energy Commission to publicly address itself to the Governor and people of Alaska and make scientifically based assurances that there will be no temporary or permanent harm or damage to the people of that area and the state or to the fish, game and other resources located

in or migrating to and from the test area; and be it

FURTHER RESOLVED that no further action on the Cape Thompson project be taken until such time as this requested report is made, disseminated and accepted by the people of Alaska; and be it

FURTHER RESOLVED that copies of this resolution be sent to the Chairman of the Atomic Energy Commission and the Alaska delegation in Congress.

Wilderness Society Protests

In adopting a resolution to protest Project Chariot, the Wilderness Society made the following statement at their annual meeting at Pine Creek Camp near Salmon, Idaho:

"Project Chariot is an attempt by the Atomic Energy Commission experimentally to blast a harbor* at Cape Thompson in Alaska by

* Although the word "harbor" is still used to describe the excavation to be made by Project Chariot, any practical use as a harbor has been denied even by the AEC.

nuclear detonation of one 200 kiloton bomb and four 20 kiloton bombs. The bomb which destroyed Hiroshima was one of these smaller bombs. Although studies are being made of wildlife in the region, including the neighboring seas, there is inadequate evidence of the effect of such detonations on wildlife. It is unquestionable that such detonations would unalterably destroy the wilderness area of the westerly end of the Brooks Range, our last great wilderness area in the world not in a tropical region. It would destroy the habitat of a large number of land and marine species and nesting areas of numerous species of birds.

"Not only might the Eskimos in the region be affected by the damage to the land and the living things on which they depend for their sustenance, but the danger of radiation, small as it seems to be by comparison to above-ground detonations, might affect people over far greater areas. Furthermore, the blasting of a harbor on the Bering Sea is a threat to marine life at all ocean depths and over a great expanse. There is no limitation to the mobility of oceans."

Project Chariot — A Comprehensive Review

(NOTE: In compiling the following history of Project Chariot, and in reviewing the human ecology of the Point Hope area, the News Bulletin is indebted to Don Charles Foote, currently senior investigator for human geographical studies for Project Chariot. The review of the biological studies at Cape Thompson was made by Dr. William O. Pruitt, Jr., senior scientist in charge of terrestrial mammal investigations and the botanical summary is the work of Leslie A. Viereck, senior scientist in charge of botanical studies for the project. All are members of the Alaska Conservation Society.)

History and Technical Data of Project Chariot

Technically, Project Chariot is an experiment in underground nuclear explosions, born from a marriage between atomic weapons tests which produced craters and those which were totally contained underground.

During the 1955 nuclear weapons testing series in Nevada, scientists from the Atomic Energy Commission's Lawrence Radiation Laboratory in Livermore, California, realized that a growing public concern for radioactive fallout would be a serious limitation on further weapons tests. As a result, the idea of contained nuclear weapon explosions was considered and finally tested in September, 1957, when "Rainier," a shot equal to 1,700 tons of TNT, was detonated deep in a Nevada mountain.

However, there existed in 1957, as there do today, fundamental problems in applying nuclear explosions to civil engineering. Such an application requires enough knowledge to accurately predict effects of buried nuclear blasts which form craters. In con-

trast to this need, there is no adequate theory for cratering, by chemical or nuclear explosives. Even carefully controlled cratering experiments by conventional high explosives remain unpredictable within limits. For this, and other reasons, it is not certain how the cratering phenomena of nuclear and chemical explosives can be compared. Since no adequate theory of cratering exists, some scientists believe test explosions, of both charge types, remain the most expedient means by which empirical theory may one day be supplanted by dependable mathematical prediction models.

In the case of buried nuclear charges, the only reliable data on the cratering effects are derived from weapons tests in Nevada desert alluvial soils. In 1951 there had been Jangle (S)urface and Jangle (U)nderground and in 1955 Teapot Ess. All three explosions were equal to about 1,200 tons of TNT; the latter two at comparative burial depths* of 16 and 63 feet respectively.

From these latter atomic cratering tests it was theorized that a maximum amount of earth would be removed from above a nuclear explosion if the burial depth was somewhat less than the comparative depth of Teapot Ess. In this case, one could predict that about 75% of the crater material would be thrown into the atmosphere to settle as fallout, and an approximate 25% into a crater lip which would necessitate reshaping by conventional means.

Drawbacks to this theory were that from 90% to 99% of the total nuclear explosive radioactivity would be released to the sur-

* A comparative depth equals the actual depth divided by the cube root of the energy yield.

face environment, together with air and ground shocks.

Nevertheless, research by the AEC had shown that nuclear explosives, buried at depths comparable with Teapot Ess, could compete favorably with conventional earth-moving means when large craters were produced because a large percentage of the crater debris was scattered thinly about the landscape as fallout. Thermonuclear (hydrogen or fusion) devices were preferred for this work since they would produce large excavations with less residual radioactivity than a similar energy release by fission (uranium or plutonium).

In late 1957, for some reason which the AEC has not made clear, the northwest coast of Alaska, from Nome to Point Barrow, was selected as the general area for an economically useful deep-sea harbor to be created by nuclear explosions. Subsequent library research by the USGS and a Minneapolis company, during the spring of 1958, indicated that about the only place a large-scale atomic blast could be detonated was near Cape Thompson, Alaska.

Furnished with this information and without first-hand knowledge or a thorough understanding of the Cape Thompson area, the AEC applied for a land withdrawal of 1600 square miles; an area much larger than the Nevada Test site. To this day the mechanics of the land withdrawal and the status of the land remain very unclear.

At the time the land withdrawal application was filed (June, 1958), the AEC announced to Alaskans that field studies would be carried out in the Cape Thompson region during the summer of 1958. These investigations would, among other things, ensure that such a harbor-producing nuclear explosion

would be safe with respect to persons within and outside the immediate area and to fish and wildlife.¹

Alaskans learned more about Project Chariot during mid-summer, 1958. Its design was to detonate six nuclear devices equal to a total of 2,400,000 tons of TNT at burial depths comparable to Nevada tests which had released to the atmosphere from 90% to 99% of the total radioactivity, and about 75% of the excavated crater debris. At no time, either in 1958 or now, has the AEC made clear to Alaskans the effects of such an explosion or what studies were done during the few weeks of summer, 1958, to ensure such a blast would be safe to people, and to fish and wildlife in and outside the Cape Thompson area.

In October, 1958, the United States ended its atomic weapons testing with a series of explosions which included several shots beneath a mountain. One explosion, "Neptune," was buried at a comparative depth of about 210 feet and equal to approximately 100 tons of TNT. Upon detonation, Neptune broke through the mountain slope to produce a crater and release from 1% to 2% of the total radioactivity.

Empirical theory suggested by Neptune, concern expressed by knowledgeable Alaskans about possible effects of Project Chariot, the obvious fact that the Cape Thompson area could not justify an economically use-

ful harbor and the impact of unfavorable opinion expressed by the world public and scientific community, combined to influence the AEC during late 1958 and early 1959.

By January, 1959, the original idea of Chariot was totally abandoned by the AEC and in its place a *completely new concept* was introduced. Project Chariot is now an experiment designed not to build a harbor, but to test the theory that nuclear explosions buried at comparative depths between Teapot Ess (63 feet) and Neptune (210 feet) will produce a crater and, at the same time, trap a significant amount of the total radioactivity below ground. The extent to which Chariot is an experiment is evident when one realizes that no nuclear explosion has ever been detonated at comparative burial depths of about 160 feet (the approximate depths of Project Chariot); no nuclear explosion has been detonated in the permanently frozen mudstone geologic formation of the Cape Thompson site; and never before have there been a series of simultaneous underground atomic blasts.

When the new Chariot was presented to Alaskans in February, 1959, it was one-fifth the original size or equal to 460,000 tons of TNT. In addition, assurances were given that extensive pre-shot biological-environmental investigations would determine the optimum time of year for the Chariot detonation and the most desirable orientation of

the fallout zone. These determinations would be predicated on causing the least amount of damage to the populations of animals, birds, fish and plants in the affected area, minimizing subsequent perturbations in the present balance of the ecosystems. To make such determinations requires a prediction model of what the effects of Chariot will be.

During the summer of 1959, a full contingent of environmental scientists began an inventory of the Cape Thompson area which, until then, was virtually unknown to science. From autumn, 1959, to spring, 1960, a reduced research program continued with human studies among the Eskimo people, and biological work on the mammals and botany. It was in spring, 1960, that Alaskans learned Project Chariot was further reduced to its present total energy yield equal to 280,000 tons of TNT divided between the simultaneous detonation of four devices each equal to 20,000 tons of TNT and one device of 200,000 tons TNT equivalent.

From late spring, 1960, to autumn, intensive biological studies continued in the Cape Thompson region. Winter investigations in 1960-61 were similar to the previous year except that the consideration of marine mammals was given far more attention than the previous year.

(Continued on page 12)

Will Colby Honored at Wilderness Conference

On April 8, 1961, at the Wilderness Conference Luncheon, the first annual John Muir Award was presented to William E. Colby, Honorary President of the Sierra Club. This award recognizes outstanding contributions to preservation of American scenic resources. Each year it will honor someone who has been carrying forward

the historic work of John Muir in rescuing for our time those primeval places epitomized in the great national parks. President Nathan C. Clark had this to say as he presented the Ansel Adams photograph and the award plaque to Mr. Colby:

IN THE YEAR 1898 William R. Dudley, one of the Sierra Club's many eminent Foresters, wrote as follows: "The Sequoia of the Sierra was fortunate in having John Muir

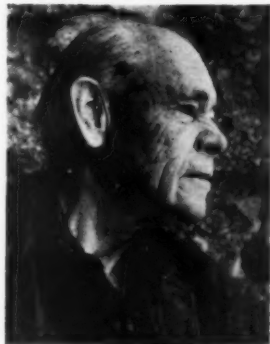
too, including that noble gesture of the earth, the Sierra Nevada.

There is no difficulty in tracing John Muir's leadership that made the Sierra one of the best protected mountain ranges in the New World—something epitomized in the fact that there are three great national parks in that range and a fourth guarding its northernmost tip. We need to keep reminding ourselves of that debt from time to time, as we search for a kind of courage Muir had in facing the kind of preservation problems that still beset us and will continue to beset us as long as there is anything beautiful in nature worth preserving.

It is appropriate on this occasion, the club's Seventh Biennial Wilderness Conference, to remind ourselves of our debt to Muir by identifying a man who has done the most toward achieving the goals of John Muir, son of the wilderness. Our only apology is that we didn't do it sooner.

For six of the club's seven decades the

Sequoia of the Sierra and the national parks, the wilderness, and the Sierra Club itself have been fortunate in having a friend whose devotion has been equal to Muir's. He was a friend of all these places—also of the great and unique coast redwoods which are even now still in great peril and which are the glory we inherit merely by being Californians. I want to show you this famous picture [see following pages] of a beautiful deep forest with its black, mysterious distance, and the tall, aged trees in the foreground. Their mood and their majesty are in this great photograph by our own Ansel Adams. A fine print has been selected and framed as an appropriate symbol, we hope, to recognize this significant occasion. On behalf of the committee on the John Muir Award, it is an honor and a privilege for me, as president of the Sierra Club, to award this photograph and the committee's accompanying tribute [see following pages] to our Honorary President, William E. Colby.



Will Colby
by
Cedric Wright
from
Words
of the Earth

for a friend. And now it is the best protected species of tree in the new world." Other aspects of nature had John Muir for a friend

The First Annual
John Muir Award
1961

Presented by
the Sierra Club to

William E. Colby

- ¶ in gratitude for the excellence of his contribution toward preserving unspoiled a living part of the American Heritage of wilderness
- ¶ in recognition of a debt owed to him for creative thinking and leading in conservation that we believe will truly make a difference a hundred years from now in the face of this land
- ¶ and in appreciation of his role in assuring that America will remain more beautiful than it otherwise could have been for those who come after us.

His achievement carried forward the historic work of John Muir in rescuing for our time those primeval places epitomized in the great national parks.

(signed) NATHAN C. CLARK
President

for the Committee on the John Muir Award





PROJECT CHARIOT

(Continued from page 9)

To date Alaskans have received only one official statement based on the Chariot Environmental Program. This statement was prepared on December 10, 1959, and verified, in nearly every detail, opinions held by the AEC before the biological program had rendered any results²; i.e., that springtime, March or April, was the preferred time of year for detonation and fallout could be directed either landward or seaward. The justifications for these conclusions were not supported by facts gathered during the biological program. Verbal and written protests to this effect from senior scientists representing the studies of human geography, land mammals, sea cliff birds and botany have, to date, not been made public by the AEC nor has there been any public evidence that the protests have been acted upon.* In addition, the AEC has not offered the Alaskan public any summary of the findings of the two-year environmental program. Many pertinent questions remain unanswered about Project Chariot.

The empirical theory of crater formation, based essentially on Neptune, suggests that the earth's surface can be heaved upward and out by a combination of shock waves and venting radioactive gases. However, it would seem that this technique would produce crater lips of very considerable thicknesses, the size and fate of which have not been clearly described by the AEC. The question is, will a technique which merely heaves radioactive earth to the sides of a hole, the sides and bottom of which are shattered and fractured by the explosive force, actually be a means competitive with conventional earthmoving techniques? That is, to compare the finished results of both methods, one must consider the abnormal costs and problems of moving radioactive crater lip debris and the problems of construction on earth which is fractured and broken to considerable depths.

Chariot is buried between comparative depths which released 90% to 99% of the total radioactivity at one end (Teapot Ess) and 1 to 2% at the other (Neptune). Therefore, Chariot lies in a region of uncertainty as to what fraction of the radioactivity will be vented to the atmosphere. One basic reason for the Chariot experiment is to answer this very question of radioactivity release.

Despite this, the AEC has offered predictions on the amount of radioactivity to be ejected into the surface environment from Chariot. These estimates have varied from 1% to 30% of the total fission yield but are currently thought to be about 15% of the

total radioactivity available. Two-thirds of the vented activity will presumably be in the crater lip debris and one-third in fallout at greater distances.

Previous experience in underground nuclear explosions show that vented radioactive debris will be enriched in those radioisotopes which exist as gases during the first seconds following detonation. Thus, enrichment of Strontium 90 and Cesium 137 were five times over normal, Strontium 89 and Arsenic enriched by a factor of 10, Barium 140 from 2 to 6 times and Cerium 141 from 2 to 10 times. Since Strontium 90 and Cesium 137 both decay slowly over many years, it is not surprising that evidence from Neptune suggested that the radiation field from fallout decayed much slower than would normally be expected.

The question then remains, how accurate are any prediction models of radioactivity release from Chariot?

A fallout pattern is primarily a function of wind, the height and structure of the radioactive cloud, the size of contaminated particles and conditions of precipitation. In the case of Chariot, all these factors present problems.

First, the region of Cape Thompson is notorious for its hurricane-force surface winds and periods of opposing surface and upper wind patterns. Second, the structure of the radioactive cloud will apparently produce a vertical column of debris from the surface to the tropopause, or about 30,000 feet high. Third, the frozen mudstone of the Chariot site readily fractures into small pieces a few inches in length. Should the mudstone disintegrate under shock to its minimum grain size, then a significant percentage of the radioactive cloud might be of particles 50 microns or less in diameter. Lastly, since the preferred time of year is spring (or an alternative in autumn) one can expect air temperatures below freezing. Fallout, therefore, will probably be as snow from condensing radioactive steam and upon snow as debris particles free-falling or scavenged out by precipitation.

The AEC currently predicts that 80% of this fallout will occur within the first thirty or so miles downwind from Project Chariot. However, such prediction models have not discussed the exact particle sizes to be expected from Chariot nor the mechanics of fallout as snow and its subsequent surface distribution and concentration by winds.

Three factors which contribute to the biological significance of fallout are the particular radioisotope concerned, the particle size, and the degree to which these particles are soluble in water and acids similar to digestive juices. For example, it would seem that particles 44 microns or less in diameter, are introduced into grazing animals through plant surfaces which act as selective collectors for small fallout particles.

Although the AEC has offered prediction models of fallout intensities and press statements that no biological damage will result from Project Chariot, the AEC has not yet made clear exactly what concentrations of various radioisotopes will be released by Project Chariot, what the particle sizes will be and to what degree the fallout or throw-out will be soluble or otherwise available to the biological environment. One thing is evident, Strontium 90 and Cesium 137 will form a significant part of the vented radioactivity.

The prediction models for air and ground shocks from underground nuclear explosions are still not firmly established. Prediction models for Chariot indicate that damaging earth shocks will be felt along the Cape Thompson cliffs and air shocks at varying distances dependent upon meteorological conditions and the degree to which Chariot conforms to empirical theory. Regardless, no assurances have been given that seismic disturbances will not be triggered in the Cape Thompson area; a region of folded and faulted rock, and apparently, of previous earthquakes.

In summary, the new Project Chariot of 1961 is purely an experiment to test uncertain theories about nuclear explosions buried between comparative depths of 63 and 210 feet, and the effects of simultaneously detonated nuclear charges in a line. The effects of interest will include crater formation, the extent to which radioactivity is released and its biological significance, and the results of flooding a crater immediately after a big buried nuclear explosion.

Whether or not the theory behind Project Chariot will prove nuclear explosives to be competitive with conventional earthmoving means will remain obscure until detailed costs are released based on the reshaping of radioactive throwout debris; building problems on fractured and shattered substrata; and above-normal costs associated with working in an environment contaminated by radioactivity.

Any plea for an exact prediction of the effects of Project Chariot is unrealistic because Chariot is purposefully designed to study the behavior of buried nuclear explosions under unknown conditions. In addition, while the Project Chariot Environmental Program stands as a milestone of research in AEC nuclear explosive testing, it must be remembered that the mere biological description of an area cannot, in itself, provide enough knowledge for a prediction of biological effects from an unpredictable nuclear blast. Such prognoses require more knowledge in the general field of radiation biology, the particular circumstances of Alaska's arctic environment and the exact mechanics of nuclear explosives buried at depths comparable with those of Chariot.

* It is expected that the AEC will soon make public a new statement based on the biological program.

It must be clearly understood by Alaskans that the new Project Chariot is an *experiment* in every sense of the word. Moreover, the experiment will not produce a harbor since studies indicate that one good storm will transport as much as 27,000 cubic yards of beach material a day past the harbor mouth.³

Finally, Alaskans must realize that their Arctic region is adjacent to the Soviet nuclear testing centers. . . .

Review of Biological Research Results

The Ogotoruk Creek region, the site of Project Chariot, situated where a mountain range meets the sea, is characterized by varied topography. Ogotoruk valley is set in an upland varying from rolling to hilly to mountainous while the valley floor is undulating to rolling. The ridges are limestone and shale and the valley floor is underlain by mudstone. The climate of the region is coastal Arctic, with short cool summers and long cold winters. Temperatures are rarely extremely low (below -35° F.), being modified by the proximity of the sea. The almost constant winds result, however, in very high windchill values. The winds markedly rework the winter snow cover. During the winter, some tributary valleys are almost completely filled with snow, others are scoured clean. The uplands are frequently blown bare of snow and much of the cotton-edge tussock valley floor is also blown clear. Calculations in April 1960, at approximately the time of annual maximum snow accumulation, revealed that 29 per cent of the Ogotoruk valley was bare of snow.

Because of currents and winds, the sea ice moves, forms, breaks up and reforms. The winds sweeping down the Ogotoruk valley frequently cause a large area of open water (measured in terms of square miles) to occur off the valley mouth.

Environmental factors of special importance to Ogotoruk valley organisms are: (1) the winds which clear away so much of the snow, which keep the adjacent sea relatively free of ice, and which result in very high wind-chill values, and (2) the varied topography which results in a wide spectrum of terrestrial habitats.

Terrestrial Plants

The general location of the Cape Thompson region is of great botanical significance. Being on the coast it possesses many shore plants that do not extend more than a few miles inland from the beach. Being the westward limit of the Brooks Range, it is the logical avenue for plant migrations from Asia to North America. Probably as recently as 11,000 years ago when the sea level was much lower, a lowland extended westward from the Cape Thompson region and connected it with the Asian mainland. In the Cape Thompson region there is, then, a chance for a mixing of the Brooks Range plants, the coastal plants, the Arctic lowland plants, and the Asian plants.

The botanical investigations at Ogotoruk Creek bear this out. On Sahlgvik Ridge (which forms the northwestern side of the Ogotoruk valley) grows a small lichen (*Evernia esore-*

diosa) which is an Asian plant known in North America only from this location. An Asian grass (*Koeleria asiatica*) grows quite commonly on the gravel bars of the streams in this area and is known outside of Asia only from the Cape Thompson region and a few locations in the Brooks Range. Another lichen (*Mastodia tessellata*), found commonly on the bird cliffs of Cape Thompson and northward toward Cape Lisburne, is an eastern Asian species otherwise collected in North America only from the Queen Charlotte Islands.

Of further significance to the richness of the flora of the region is the presence of large areas of calcareous rocks. Limestone rocks have often been noted by botanists to possess a distinctly different group of plants than those found on surrounding rocks. Many plants often reach the limit of their geographic range in limestone. This is undoubtedly the reason that the Cape Thompson region forms the northern limit of several plants and extensions of range of several other species. The common fireweed (*Epilobium angustifolium*), for example, was found growing in this area, an extension of range from Kotzebue, a distance of 100 miles. In the summer of 1960 the Twinflower (*Linnaea borealis*) was found growing in a protected area many miles north of Cape Thompson, an extension of range of this small plant of nearly 150 miles.

Part of the basic study of the Ogotoruk val-

ley has been to map the plant communities or vegetation units for the Ogotoruk Creek drainage, an area of approximately 50 square miles. Three plant communities dominate the landscape and account for over 75 per cent of the plant cover.

On the windswept ridges, of which there are many in the valley, a sparse low mat of Mountain Awns (*Dryas octopetala*) covers extensive areas. These ridges are swept by strong winds during the summer and blown free of snow in the winter. Very little soil develops on the ridges and plants cover less than 50 per cent of the ground.

In the wetter, more protected slopes of the valley the tussock tundra covers large areas, being the most extensive vegetation type in the valley. It consists of the well-known cotton-grass tussocks (*Eriophorum vaginatum*), along with lichens, low ericaceous shrubs, and dwarf willows and birch. These tussocks furnish excellent protection and nesting sites for small mammals.

In the wettest places, and usually where standing water is present throughout the summer, one finds a type of vegetation that has been called the "wet meadow." Sedges make up nearly a continuous and smooth mat over these extensive wet areas.

Many other plant communities are found in the Ogotoruk valley and have been described in detail by the botanists. Many are associated

Dennis the Menace

By HANK KETCHAM



"... an' don't let 'em blow up the world 'til I get to see the REST of it!"

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with depressions that fill with snow in the winter, with solifluction processes, or with the gravel bars of the creek itself. All must be considered in a basic botanical survey of a region.

The study of the vegetation of an area is important in itself and because the plants provide food and cover for the animals. The detailed study of the various plant communities is necessary as a basis for understanding all of the food and energy relationships between the organisms of the tundra.

Important points brought out by the botanical studies are: (1) the Cape Thompson region possesses a uniquely rich flora for an Arctic region. So far, 293 different species of flowering plants, 50 known species of mosses, and 57 known species of lichens have been recorded. This rich flora is undoubtedly due to the position of the Cape Thompson region at the western end of the Brooks Range, its variety of bedrock (including limestone), and the varied topography. (2) Detailed analysis of the vegetation of Ogotoruk Creek has shown that lichens and sedges make up a large percentage of some of the main vegetation types listed above. On the exposed ridges with *Dryas*, lichens make up 51 per cent of the cover; in the tussock type, sedges make up 40% and lichens 6%, while in the wet meadow types, sedges make up 50% of the plants.

Terrestrial Mammals

Twenty species of terrestrial mammals have been recorded from the Ogotoruk Creek Region. (Nineteen have been recorded officially; identification of the twentieth species has just been completed.) These are: Tundra Shrew, Masked Shrew, Grizzly Bear, Polar Bear, Wolf, Red Fox, Arctic Fox, Wolverine, Ermine, Least Weasel, Arctic Ground Squirrel, Red-backed Vole, Tundra Vole, Alaska Vole, Muskrat, Brown Lemming, Collared Lemming, Porcupine, Caribou and Moose. Two species not found there today were present within the memory of men now living. These two species, Dall Sheep and Marmot, were extirpated locally probably by over-hunting due to intensive Eskimo utilization of the region.

The populations of mammals show marked cyclic fluctuations. For example, 1959 was a high year in the Ogotoruk region for most kinds of small mammals and samples gave a biomass of Alaska Voles of about 3 pounds of mice per acre of habitat. In 1960 the same sample plot produced only 3½ ounces of mice per acre of habitat.

If the small mammal cycle of the Ogotoruk region has the same frequency as it does in other Arctic regions the voles will build up and be high again probably in 1963 or 1964.

The state of the cycle governs essentially everything else in the terrestrial ecology of Northern regions. When the voles or lemmings are high, it seems as if everything—foxes, wolves, grizzlies and wolverines—subsist on them while numbers of carnivorous birds—owls, hawks, jaegers, and ravens—congregate in the region. The food web depends on 3 main herbivores—the voles and lemmings, the Arctic ground squirrel and the caribou.

Two of the terrestrial carnivores (Grizzly

Bear and Wolverine) which occur in relatively high frequency in the Ogotoruk region are considered by the National Wildlife Federation to be in danger of extinction.

The Barren-Ground Caribou are commonly found in the Ogotoruk region, sometimes in great numbers. Caribou perform extensive migrations and the individuals in the Ogotoruk region one month may be many miles away the following month, while they are replaced by other individuals streaming through.

The so-called "Arctic Herd" of Alaska caribou is estimated to number, conservatively, 200,000 animals. About 70,000 spend the winter in the region covered by Project Chariot studies—northwestern Alaska from Cape Lisburne south to the Kobuk River and from Point Hope eastward to about Howard Pass in the Brooks Range. All the villages in the area utilize these caribou. Great amounts of caribou meat are necessary to support not only the Eskimo villages of Point Hope and Kivalina, which have been studied intensively, but also Noatak, Kotzebue, Noorvik, Kiana, Kobuk, Shungnak, Ambler, Point Lay, Wainwright, Barrow and others even farther removed from Ogotoruk itself.

In late October, 1960, several thousand caribou utilized for the rut the region northeast of Kivalina and just southeast of Ogotoruk. Since adult bucks shed their antlers very soon after the rut and since shed buck antlers have been commonly noted in the Ogotoruk valley, it has been concluded that in some years the caribou utilize the Ogotoruk valley itself for the fall rut.

The Alaskan bush pilots long ago recognized the uniqueness of the Ogotoruk region because from the air they could see how this restricted region appeared brown or speckled in contrast to the white color of other arctic regions.

The Ogotoruk valley, bounded on one side by Sahlgivik Ridge and on the other by the Tahlaveerut Hills, is the mouth of a great topographic funnel which stretches for nearly a hundred miles inland. There is almost always a wind whistling through the tip of the funnel.

This famed Ogotoruk wind is actually the reason why the region is so important as a caribou winter range. It has been found that geographic variations in snow cover are of prime importance in governing the winter distribution of caribou.⁴ It comes as no surprise then to discover that a region such as the Ogotoruk, with little snow cover, is an important winter range for them.

Important points brought out by the studies of the terrestrial mammals in the Ogotoruk region are: (1) the relative richness of the Ogotoruk region in number of species. To a person familiar only with the temperate zone or the tropics, twenty species of land mammals does not appear impressive. But for an Arctic region this is a rich mammalian fauna. For example, southern Baffin Island in the Arctic Islands Game Preserve of Canada has 13 species, southern District of Keewatin in the Northwest Territories has 20 species, Southampton Island has 13 species and Alaska's newly-created Arctic Wildlife Range has 24 species. Even Mount McKinley National Park has only 33 species.

(2) The dependence of the food web upon only 3 main herbivores. Thus any disruption of the populations of any of these 3 herbi-

vorous types would have far-reaching effects throughout the food web. (3) The importance of the Ogotoruk region as a winter range for caribou, the year-round presence of some numbers of caribou in the Ogotoruk region, the use of the region for the fall rut, and the great distances traveled by caribou in their yearly migrations. (4) The relatively frequent occurrence in the Ogotoruk valley of two mammals (Grizzly Bear and Wolverine) on the "danger list" threatened with extinction.

Marine Mammals

Ten species of marine mammals are known to occur regularly in the Ogotoruk region. These are: Bowhead Whale, Grey Whale, Finback Whale, Killer Whale, Beluga, Porpoise, Ringed Seal, Harbor Seal, Ribbon Seal, Bearded Seal, and Walrus. In addition, other species such as the Alaska Fur Seal may occur as wanderers. The Polar Bear and Arctic Fox might also be considered as marine mammals for our purposes. The magnitude of the commercial Polar Bear guide business has been covered in previous issues of *The Alaska Conservation Society News Bulletin*. Both the Polar Bear and the Arctic Fox are members of circum-polar wandering populations.

Our knowledge of the biology of the marine mammals is scant. Only sketchy numerical data on populations are available. For example, during 22 days of whaling at Point Hope in April and May, 1960, a total of 124 "whales" were sighted. These were not identified to species, but Bowhead were probably in the majority. Another example, on 6 February 1960, 185 "seals" were counted on thin, new ice off Crowbill Point, adjacent to the Ogotoruk valley. Again, they were not identified to species, but were undoubtedly Ringed Seals.

The marine mammals are characterized by their extensive seasonal migrations and migration routes—one of which passes the mouth of Ogotoruk Creek and Point Hope. The Grey Whales overwinter off southern California while Walrus overwinter in the Bering Sea. In the spring many of the large whales travel on to the east of Point Barrow and spend the summer in the Canadian Arctic. The distribution of many of the kinds of marine mammals is correlated with ice conditions—whether presence of ice, lack of ice, or ice covering a certain percentage of the sea. The Ringed Seal and Bearded Seal seem to be tied to the ice; Porpoises and Harbor Seals seem to avoid the ice while the large whales, Beluga and Walrus are associated with particular amounts of ice cover. Thus for each species there is an annual cycle of presence or absence.

Important points regarding the marine mammals are: (1) the scanty knowledge available concerning their biology, (2) the large numbers of individuals that frequently occur, (3) the widespread migrations some species make, (4) the fact that one main migration route passes the mouth of Ogotoruk creek, and (5) the close relationship between species and numbers of individuals present and ice conditions.

Terrestrial Birds

Seventy-nine species of terrestrial birds have been recorded from the Ogotoruk region. The groups commonly known as "shorebirds" which usually are present in great numbers in coastal

Arctic localities are mostly lacking in the Cape Thompson region. In contrast, more species of passerine or "perching" birds are present. Some of these passerine species are present in very substantial numbers. Very little is known about the biology of these species in the region, especially such aspects as population densities, fluctuations and productivity. Because of the geographic location of the Ogotoruk region, such Siberian species as the Red-spotted Blue-throat and the Yellow Wagtail are found there. There is a great seasonal change in the avifauna of the Ogotoruk region. Eiders, Murres, Guillemots, and Old-Squaw Ducks occur throughout the winter because of the open water present while Ravens, Rock Ptarmigan, Willow Ptarmigan and Gyrfalcons are also present.

Important points regarding the terrestrial birds are: (1) The difference in kinds present compared to those usually found in Arctic coastal regions, (2) the lack of knowledge of important phases of the biology of those species found there, (3) the presence of Siberian species and (4) The marked seasonal change in total numbers of species and numbers of individuals.

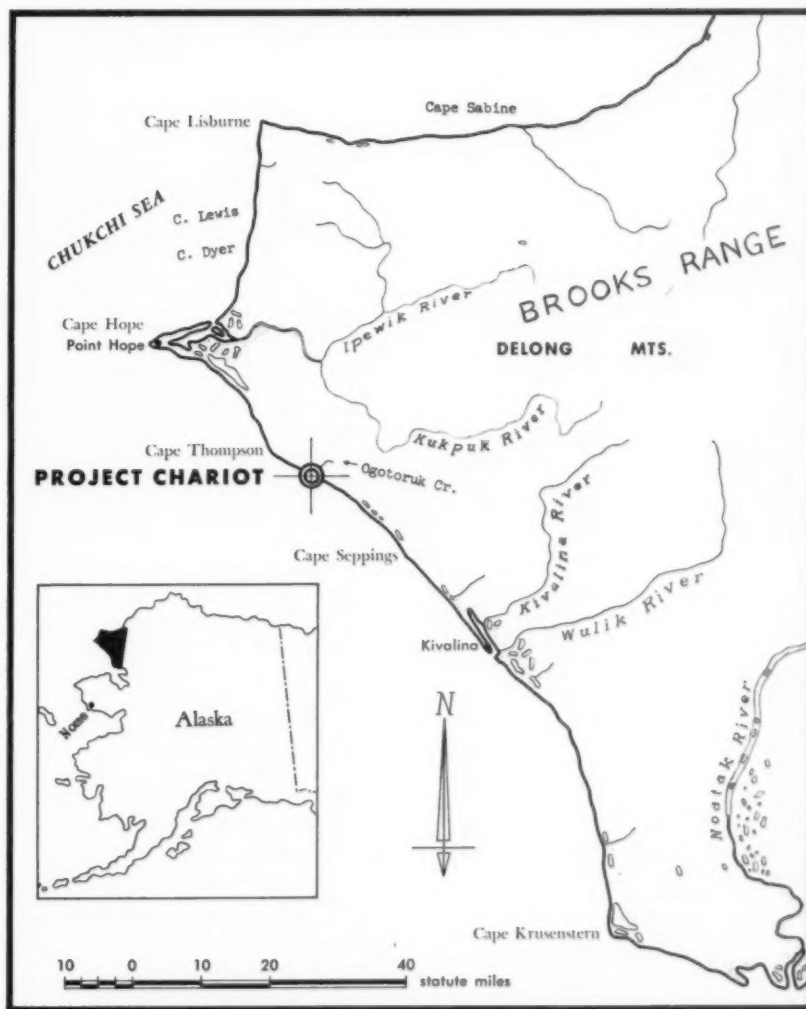
Sea-Cliff Birds

Sahlgvik Ridge drops off into the sea in a sheer cliff. Here and for six miles northwestward the coastline is formed by huge cliffs, interspersed with small creek valleys. Each year the crevices and ledges on the cliffs are utilized for nesting by several species of birds highly specialized for such an environment. These are Common Murres, Thick-billed Murres, Black Guillemots, Pigeon Guillemots, Horned Puffins, Tufted Puffins, Glaucous Gulls and Kittiwakes. Most of these species fly many miles out to sea to feed primarily on tiny fish. The sea-cliffs form an important ecosystem, with the inclusion of such avian "utilizers" as Ravens, Peregrines and Gyrfalcons as well as Glaucous Gulls and Kittiwakes which depend on the pelagic fishing birds as "producers."

Censusing of the cliff colonies in the Cape Thompson vicinity has revealed that somewhat over 200,000 individual birds of several species are present.

A very interesting aspect of the sea-cliff ecosystem is the presence of two species of Murres. Several biological problems of fundamental importance are involved here. In the Cape Thompson region the two species occupy different types of ledges—Common Murres on long continuous ledges, usually on massive resistant dolomitic limestone, with Thick-billed Murres on limestone where the bedding is thinner, easily fractured and forming narrow discontinuous ledges. These highly specialized cliff-nesting birds thus possess strong behavioral restrictions in choice of nesting sites. In addition, social factors may govern their choice of nesting sites. There are several cliffs in northwestern Alaska which seem to fulfill the requirements for cliff-nesting birds, yet birds are not present on them. Other colonies are surrounded by cliffs that appear suitable as nesting sites, yet the colonies do not expand into them. Murre colonies occur on the Diomed Islands and the Chamisso Islands, but the vast majority of the Murre population in the Alaskan Arctic nests in the Cape Thompson-Cape Lisburne region.

Important points in regard to the cliff-nesting pelagic birds are: (1) The exceedingly restricted



Jim Crooks

habitat available for these highly specialized organisms, (2) The very large numbers of individuals utilizing the sea-cliffs environment and (3) The strong restrictions on nesting sites imposed by behavioral attributes of the birds.

Fish (Fresh Water)

Because of the great seasonal variations in water level, because of the depth of winter freezing and because the mouths of Ogotoruk Creek and other streams reaching the beach are frequently plugged by storm-raised gravel, very few species or individuals of fresh water fish are found in the Ogotoruk region. Several spots on the Kukpak River sustain good populations of grayling, trout and various species of salmon.

Fish (Marine)

Marine fishes fall into two groups—strictly marine forms and those kinds that enter fresh water for breeding. Strictly marine fishes of commercial size and quantity are very few in the Ogotoruk region. A total of 43 species of marine fishes have been identified from the Chariot studies in the adjacent Chukchi Sea.

The data on species and number of individuals of small non-commercial marine fishes are indirect, resulting mainly from study of the pelagic-feeding cliff birds. Calculations of the magnitude of the sea-cliffs ecosystem reveal that the cliff-nesting birds of the Cape Thompson region consume some 50,000 pounds of marine life per day. Most of this is fish. Therefore there must exist tremendous populations of small marine fishes in order to furnish this much daily surplus on a sustained yield basis. Further discussion of anadromous marine fishes will be found under the Human Ecology section.

Invertebrates

The Hanford Laboratory group has surveyed the invertebrate fauna of the land and fresh water. Because of the magnitude of the task of identification of specimens, their results are not yet available.

Human Ecology

There are several good ecological reasons why man has been present in the Cape Thompson region for thousands of years. Undoubtedly the most important is the availability of a variety

PROJECT CHARIOT

of habitats for products of the land. Man is able to exist in the North, on a permanent self-sufficient basis, only by utilizing a seasonal succession of habitats. Only rarely can one habitat produce enough food and materials in variety and quantity sufficient to support a human population on a year-round occupancy. The Cape Thompson region is one of those few regions in the Arctic where a variety of habitats allows man to capitalize on moving ice for winter sealing, good caribou winter range for winter and spring hunting, bird-cliffs for spring and summer egg and meat collection, large rivers and lagoons for fish, a projecting piece of land (and moving ice) for spring whaling, mountains for winter and spring fur production, inland waters for late summer and autumn fishing. This is the real base of the human economy—the presence of a seasonal succession of habitats.

Kivalina

This village of 145 Eskimos is situated 40 miles southeast of Cape Thompson on a bar enclosing Corwin Lagoon. Into this lagoon empty the Wulik and Kivalina rivers. The people of Kivalina are extremely dependent upon their natural resources for food as well as fuel. The availability of these resources varies with the seasons. In the early fall the major emphasis is upon fishing. The fish taken are about equally divided between Dolly Varden char and several species of Whitefish. Most of the fish are caught when they ascend the rivers. In 1959 the village took a total of 97,600 pounds of fish. They are prepared in a variety of ways—cooked or raw, frozen or dried or preserved in seal oil.

In late fall the emphasis shifts to caribou hunting. In 1959–1960 the greatest caribou hunting by Kivalina people took place in October and November in the Cape Seppings region and in the winter in the region between the Wulik and Kivalina rivers. In February 1960 the caribou hunting range began to move north into the Kukpuk drainage and in March it was in the region extending from the Kukpuk River to Cape Seppings and inland to the upper reaches of the Singoalik and Okpiksikruk rivers. From October 1959 through February, 1960, a known total of 407 caribou were taken by Kivalina people. Caribou meat is eaten frozen, dried or preserved in seal oil, as well as cooked. It is hardly necessary to recount all the material things derived from caribou. Caribou skin clothing is a necessity for extended winter hunting activities. Caribou sinew is used for sewing. In Kivalina the manufacture of caribou hoof jewelry is an activity of growing economic importance.

At Kivalina, seal hunting begins in November. By December seal hunting on the sea ice is in full swing. During January and early February 1960, an open lead occurred at the edge of the land-fast ice some 4 or 5 miles from shore. In February the winds brought the pack ice back and closed the main lead, but the increasing hours of daylight caused an actual increase in hunting. Seal hunting continued through April.

Bearded Seal hunting occurs in the spring, from April until the end of June or the first part of July. Bearded Seals are large animals, weighing up to 400 or 500 pounds. This type

of hunting takes place on the sea ice between Kivalina and the Cape Seppings region.

Trapping for fur carries the Kivalina people far inland as well as up and down the coast. Wolf, wolverine, land otter and red fox are taken on trap lines extending 30 or 40 miles northeast of the village. Muskrat are trapped in the lowlands near the mouth of the Wulik River. White fox are taken on trap lines up the coast to Ogotoruk Creek and for some ten miles toward Cape Krusenstern.

The 1959 known take of marine mammals by Kivalina people is as follows: Ringed Seal - 545, Bearded Seal - 104, Beluga - 11. Data for 1960 are not yet available.

The 1959 and 1960 fur trapping data are not yet available. The take for 1958 is as follows: Colored Fox - 5, White Fox - 2, Muskrat - 12, Ground Squirrel - 13, Wolf - 1, Wolverine - 10.

Point Hope

Point Hope, a village of about 300 inhabitants situated 30 miles northwest from Ogotoruk Creek, is one of the most successful Eskimo communities in the North American arctic. It is successful because a talented and vigorous people have harmonized the cultural patterns of the modern European-American and the traditional Eskimo. Wants and needs satisfied only by cash earnings are met through summer employment and the sale of native products, which, in 1958–59, totaled about \$100,000. The demands of the Eskimo way-of-life are fulfilled by the seasonal food gathering patterns. Simply said, in order to live at Point Hope, an independent and proud man must earn money and gather his family's food from the rich flora and fauna of the environment.

To hunt at Point Hope requires a cash investment in weapons, boats, outboard motors, rifles, ammunition, tents, stoves and sundry other items. And to hunt at Point Hope means a constant effort to harvest food in its proper season and place. The hunter, like the farmer, must live in close harmony with his environment.

From September, 1959 to September, 1960, the people of Point Hope harvested approximately 400,000 pounds of meat from the ocean and the land. Point Hope hunters utilize apparently well over 1,000 seals (Ringed and Bearded) each year.

Inland hunting by the Point Hope men is essential for continued well-being in the village. Although a hunter may choose to hunt where and when he will, the usual seasons of land hunting are from mid-January to early December. Seasonal highs for inland hunting occur from September to December and mid-January to May.

Because an Eskimo hunter travels either by dog team or boat he prefers to follow water courses as access highways which are frozen in winter, open in summer. Travel is absolutely necessary for a hunter because he must seek out his game. In autumn, 1959, Point Hope people traveled by dog team more than 10,000 miles in five weeks. From Point Hope the traditional travel routes traverse the Kukpuk River or ocean shore and, in both cases, lead the hunters to Cape Thompson and the Ogotoruk Creek valley. From October, 1959, to May, 1960, for example, 140 dog teams passed through Ogotoruk Creek. This figure represents the vast majority of Point Hope's men in addi-

tion to teams from the Eskimo villages of Noatak and Kivalina. The Ogotoruk valley and its hinterland are, therefore, one of the major and important food gathering areas of the Point Hope people. During the fall of 1959 and spring of 1960, over 95 per cent (more than 67,000 pounds) of all the caribou meat eaten in Point Hope was obtained within 25 miles directly inland from Project Chariot. Nearly 100 per cent (15,000 pounds) of the village's fresh water fish came from a similar area during the fall of 1959.

Implications

Plants

Approximately 22 square miles of vegetation will be covered by ejected earth and rocks to depths ranging from hundreds of feet to an inch or so. Beyond this range the ejecta could probably have only occasional mechanical effects on the vegetation.

An important aspect of the Chariot newspaper articles has been the "flushing effect" of the spring runoff which is supposed to wash the radioactive material from the vegetation into the sea. The available data show that this is an unlikely occurrence. Investigations of fallout retention by plants after the "Teapot" series of nuclear blasts in Nevada showed that distilled water was relatively ineffective in removing fallout particles from leaves with resinous or hairy surfaces. What are the actual effects of spring runoff on particles of the sizes to be produced by Chariot and which have settled onto plant species found in the proposed fallout path?

Recall the important position held by lichens and sedges in the vegetation of the Ogotoruk Creek region. It has been found that lichens in parts of Canada are high in radioactivity when compared to other plants.⁵ This is probably because lichens act as a "sponge" for radioactive materials since they obtain their nutrients primarily from the air. The Canadian work has been verified in the Ogotoruk Creek region, where analyses show that lichens and sedges have the highest content of gamma emitting isotopes and that the Strontium 90 content of lichens in 1959 was 1.4 micromicrocuries per gram, standard dry weight, an amount several times that recorded for any other plants in the area. That Strontium 90 in lichens is made available to animals utilizing the lichens is suggested by Norwegian work which showed that domestic reindeer (very closely related to our North American wild caribou) had about twice the Strontium 90 concentrations in their bones as did domestic sheep grazing in the same region.

Caribou

Public statements regarding caribou by organizations responsible for Project Chariot have emphasized two aspects: (1) comparison of caribou with "test" cattle at Nevada

Test Site and (2) the somatic effects of direct radiation.

Without going into several ramifications of the Nevada "test" cattle situation, let us confine our discussion of the validity of comparing cattle with caribou. The Nevada test site cattle graze on open range, are herded about and we have calculated that they receive, perhaps, up to 30 percent of their food from non-range commercial feeds as well as being furnished water. From the original reports, it is impossible to calculate to how much radiation they have been exposed.

The exceedingly high Strontium 90 values already present in Alaska caribou are undoubtedly due to the high use caribou make of lichens and sedges.

It has been well-established^{4,7} that domestic cattle and caribou cannot be compared in grazing habits, behavior, or physiology. In a previous publication⁸ the AEC has suggested that cattle have a marked ability to discriminate against Strontium 90 from fallout.

The following questions should be asked by all Alaskans:

What is the radioactivity burden of north-Alaskan caribou and what contribution will Project Chariot make to these radiation levels? How do or will these levels of radiation compare with present standards for humans and for human food? The same questions apply to Alaska's northern marine mammals and fishes. Similar questions concerning the terrestrial birds, terrestrial and marine invertebrates could well be included.

Marine Mammals

The same evidence⁶ which indicates high Strontium 90 content in Alaskan caribou also suggests that certain marine mammals and fishes are concentrating this radioisotope. White fish from the Kobuk River were as high as 62.4 micromicrocuries Sr⁹⁰/gm Ca, walrus meat from St. Lawrence Island 360 micromicrocuries Sr⁹⁰/gm Ca, and Kotzebue white whale meat a maximum of 142.3 micromicrocuries Sr⁹⁰/gm Ca.

The foregoing discussion raises many important questions concerning the effects of Project Chariot on the ecology of northwestern Alaska. The dilemma is, of course, that before an exact assessment can be made of these effects, more technical knowledge must be gained by experiments like Chariot.

Sea Cliff Birds

Since the species of birds utilizing the sea-cliffs of northwestern Alaska include several that are very highly specialized for such a markedly limited habitat, what will be the effects of the Chariot seismic and shock waves upon these habitats? Having observed that Murres have not colonized the exposed face of the "new" cliffs at Eezhrinyik (Cape Lewis), which was quite possibly formed at the time of the earthquake, the story of



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which was related by Rainey,⁹ we feel that the following questions are germane:

What will be the effects of the Chariot seismic and shock waves upon all the sea-cliffs that could conceivably be recipients of them? How much collapse will occur? What will be the nature of the new exposed faces, as regards areas of exposure, slope of faces, types and sizes of ledges newly formed? Assuming that nesting habitat for x number of sea-cliff birds is destroyed, what will be the biological effects of this x number of birds added to the remaining population already saturating their nesting habitat?

Human Ecology

Finally, as regards the implications of Project Chariot to the ecology of man in the region, one thing is obvious. Food gathering and travel will be prohibited and in some cases abolished, in certain undefined areas for unstated periods of time. Until the AEC makes definite statements as to what these restrictions will be no one can begin to approach the problem of what Project Chariot will mean to the future of the native people.

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Book Reviews

HIGH SIERRA, Mountain Wonderland, by Joseph Wampler and Weldon F. Heald. Joseph Wampler, Berkeley, California, 1960. 122 pages, illustrated. \$2. (Paper.)

This is a handy compilation of some useful information on the Sierra Nevada (particularly the region of the John Muir Trail) not otherwise available in book form. Weldon F. Heald contributes authoritative introductory chapters on geology, history, climate, flora and topography, and Charles McDermand covers his special subject with a compressed but detailed one-chapter guide to Sierra trout-fishing. Joseph Wampler, who has conducted trail trips and base camps in the High Sierra for several years past, gives his interpretation of how best to visit and enjoy the area, with some emphasis on the spiritual aspects of wilderness and many pertinent quotations from John Muir. A helpful list of 80 selected books on the Sierra is included, and there is a variety of photographs.

GUIDE TO TUOLUMNE MEADOWS TRAILS, by Allan Shields, Ranger-Naturalist. Yosemite Natural History Association, Yosemite National Park, 1960 (a special issue of *Yosemite Nature Notes*). 40 pages, illustrated, 60c.

Useful information for the first-time explorer of the Tuolumne Meadows region, in booklet

form. A graded program of half- and all-day hikes is described in detail, and there are helpful articles on various aspects of walking in the mountains. Lists of birds, animals, and plants and a bibliography are included.

THE VANISHING NATURAL AREAS OF THE UNITED STATES 1960. The Nature Conservancy (2039 K Street, N.W.) Washington 6, D. C. Copies available upon request. 33 pages, illustrated.

A discussion of the destructive exploitation of landscape throughout the U.S.A. showing the various regions particularly vulnerable and how the Nature Conservancy is trying to help.

Publications by Members

HIGH SIERRA, Mountain Wonderland, by Joseph Wampler and Weldon Heald. Joseph Wampler, Berkeley, Calif., 1960. \$2. (See review this issue).

FLORA OF THE SANTA CRUZ MOUNTAINS OF CALIFORNIA—A Manual of the Vascular Plants, by John Hunter Thomas. Stanford University Press, 1961. 434 pages including 250 line drawings, \$8.50.

THE ADIRONDACKS: AMERICAN PLAYGROUND, by Charles Albert Sleicher. Exposition Press, New York, 1960. 287 pages, illus. \$3.

THE SQUEEZE—Cities without Space, by Edward Higbee. Morrow, N.Y., 1960. 348 pages. \$5.95.

Letters

High-Lights Trips

As the evenings lengthen, and I contemplate another summer trip, I'm reminded of my college days and our custom of starting out for the Sierra to avoid the heat of the Central Valley, throwing our sleeping bags down somewhere by the side of the road when we had reached the cooler foothills and continuing on to the roadhead as the sun came up next morning. Several of us bought a string of burros from a rancher at Auberry. It was cool when we started to drive them up the Toll House Grade, but blisteringly hot before we reached the cooler forests around Shaver Lake. For several summers we came back with our Burro string to visit the San Joaquin, our favorite section of our favorite mountain headwaters.

This year recalls those happy days, as I have the privilege of taking you into these same regions. Again I shall start out in the evening, but the roads will be better now; I shall pause near Shaver Lake, and next morning go on to Mono Hot Springs to set up roadhead camp at the High Sierra Pack Station to welcome you for that first meal and campfire.

The two-week Sierra High-Light Trip, starting July 15, will visit some of the grandest area of our Sierra, and in a way that will be as easy as one can travel and still penetrate regions without trails. After going over Goodale Pass and dropping down into Fish Creek where the fishing is promised to be the best in the mountains, we climb the McGee Pass trail to Horse Heaven (that name intrigues me!). After McGee Pass we cross over a trailless pass into the Mono Creek region; this is called Hopkins Pass and is not on most of the maps, but is

north of Hopkins Creek. The pack string probably will go around by trail; yet I have seen Bob Simmons take his animals over unbelievably difficult places.

After two days' pause to enable us to explore the Mono Creek area, we take several days in a thrilling cross-country trip from Second Recess, between Mounts Abbot and Gabb to Lake Italy and the upper reaches of Bear Creek, and then again by trailless route to Seldom Pass. A final camp hanging over the south Fork of the San Joaquin, and then we go down grade to Florence Lake.

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Mountain Talk

MOVING NINE years ago to a county that is the San Francisco area's last refuge against urban sprawl, I intended to contemplate the redwoods, hike the trails and fire roads, and enjoy the brotherhood of pawky jays and crafty coons.

Suburban life is not like that, I should have known. There are chores, not the least of them being the daily commuter bus. Even worse, for the past couple of years I have been caught up in a whirl of special activity which left no time for contemplation.

Last Saturday, then, was a homecoming. After depositing my ten-year-old at the junior museum for her first lesson in white-rat-holding and cage-cleaning, I headed for the nearest hills.

Our county seat is a bustling town with its own urban sprawl, but the surrounding hills are steep. To the growl of a bulldozer working overtime to take care of *that*, I made my way into a canyon along a street with the pleasant name of Mountain View.

The two-bath homes marched on either side, so new that the fathers and mothers were often out together landscaping the raw earth, while even some of the children paused in their play to watch. Backed up against vertical cuts in the yellow clay, the houses stared at each other, and at me.

The end of the street met a remnant of forest. I turned off on a stub of pavement enticingly labeled Cascade and was challenged by a native sprite, red-haired and freckled. She thought it odd that I should be looking for birds, but allowed me entrance to the darkling wood.

In a moment I was at home. A tiny stream poured over gravel at the feet of slender redwoods. In the cool air was the bitter tang of laurel. I ignored the ruined packing case stenciled *dishwasher*, and the hacked stumps. My eyes searched out ferns, and dainty white *dentaria* blooming in the shade.

After jumping across the eroded stream course I found that the faint path led up the slope into live oaks. Here it was dry. Branches hung down and I had to bend low to pass.

The trail, apparently made by deer for their own kind, switched back many times. Far away I could hear the little cascade. Nearing the headwall of the canyon there was no way to go but up into chaparral.

High above me, inaccessible except by scratching my way through manzanita, was the tree-clad ridge. A turkey vulture drifted on a breeze I could not feel. Climbing to an outlook, I glimpsed one or two roofs and the street of the sprite.

I was a few minutes from the march of suburbia, yet on a hillside so wild it was difficult to slide back to the deer trail with-

out periling the new bird manual in my hand. The sun warmed a world of green leaves and gray or ruddy bark. Underfoot were little lupines, paintbrush, mimulus. A spider darted to feed on his dangling prey as I watched.

As I plunged down to the cool grove in the canyon, I was grateful that corners of wildness survived in my time. Was I within the city limits, I wondered? Would the city *have* limits, soon, or would the groaning bulldozer push here too?

I passed the stumps of redwoods cut long ago, and the dishwasher crate in the stream

bed. As I told the sprite and her playmates, I had to hurry back to the museum. My ten-year-old would have had enough now of tending white rats and cleaning the cage of the bright-eyed fox.

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Bulletin Board

Sierra Club Board Actions

At its annual organizational meeting held on May 6th, the Sierra Club Board of Directors commended and supported the Governor of Alaska for opposing Project Chariot (the controversial proposal for a nuclear test excavation in the region of Cape Thompson, Alaska), pending a more thorough study of the total effects it would have. (See feature story this issue.)

In other actions, the Board:

★ Approved in principle the institution of "stop orders" on development of certain public lands (including the former Limited Areas in Region VI of the United States Forest Service) until determination of the highest and best use of these lands can be made.

★ Endorsed in principle two measures currently before the California State Legislature:

(1) S.B. 1046 (Senator Eugene McAteer) which would restore policy-making authority to the California State Park Commission; and

(2) S.B. 1214 (Senator Ronald Cameron) which would establish and define a State policy with regard to public recreation.

★ The Board also recommended a bond issue for acquisitions and additions to the California State Park System.

★ Wilderness Bill

Although scheduled for a vote by the Senate Interior Committee in April, no action has been taken as we go to press. Lack of letters from constituents may be playing the major role in allowing opposition to hold up consideration of this important measure. Unless the public shows more interest by letting their congressmen know their views, there is again danger that the Wilderness Bill will not go through this session.

Open Space Preservation

Identical bills in the Senate (S. 858, Harrison Williams, N.J. and others) and the House (H.R. 6537, Robert Ellsworth, Kan.) have been introduced to establish an "Open Space and Urban Development Act of 1961." Under terms of this act, states and political subdivisions would receive grants from the Administrator of the Housing and Home Finance Agency to help preserve open space land, including agricultural areas, near urban developments. A total of \$100,000,000 would be authorized for this purpose in each of the next five years.

★ Blatnik Pollution Bill

The House has passed H.R. 6441—the "clean" version of the Blatnik Water Pollution Control Act of 1956. It is expected that the Senate Committee on Public Works will hold hearings on water pollution control measures (S. 861, Hubert H. Humphrey and S. 120, Robert S. Kerr) in the near future.

★ You have a constitutional right to express your viewpoint on these matters

Oregon Dunes

S. 992 (Maureen Neuberger, Oregon) would establish the Oregon Dunes National Seashore Recreation Area to effect a coordinated method of conserving and developing this highly scenic region of the Oregon Coast under the National Park Service for the benefit, inspiration and use of the people. Differing radically from this bill is H.R. 6528 (Edwin Durno, Oregon) which would establish an Oregon Dunes Shoreline as a part of the Suislaw National Forest with "no unnecessary restrictions on the multiple purposes to which lands within the shorelands may be put."

In California

A total of 4,700 bills have been introduced into the current Legislative session, including 60 bills relating to parks, recreation and wildlife. (See Bulletin Boards for January through April.) In the remaining few weeks of the 1961 session, bills can only be introduced by special permission of the Assembly or Senate.

★ Governor Edmund G. Brown announced in early April that he would do everything possible to preserve the virgin redwoods adjacent to Big Basin in the area to be included in the enlarged park. To date, no definite announcement has been made concerning these trees, which are currently in the process of being logged.

EDGAR AND PEGGY WAYBURN

Wilderness Cards From the Sierra Club



Two for the trail—a trail far back in the Jim Bridger Wilderness Area, near the crest of Wyoming's Wind River country. It is unlikely that any place in the United States can surpass this region in providing lonely park-like places so livable and so beautiful. Wilderness Card No. 22. Photo by Philip Hyde.

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